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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/633,815	08/04/2003	Walter Wrigglesworth	PD-03W074	7495

7590 12/26/2006
Patent Docket Administration
RAYTHEON COMPANY
Bld. EO/E4/N119
P.O. Box 902
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EXAMINER

LEE, JOHN W

ART UNIT	PAPER NUMBER
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2112

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/26/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/633,815	Applicant(s) WRIGGLESWORTH ET AL.	
	Examiner John Wahnkyo Lee	Art Unit 2112	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-32 is/are rejected.
- 7) ☒ Claim(s) 2 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>20030804</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Information Disclosure Statement

1. An initialed and dated copy of Applicant's IDS form 1449, Paper No. 20030804, is attached to the instant Office action.

Specification

2. The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

- (a) TITLE OF THE INVENTION.
- (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
- (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
- (d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
- (e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
- (f) BACKGROUND OF THE INVENTION.
 - (1) Field of the Invention.
 - (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
- (g) BRIEF SUMMARY OF THE INVENTION.
- (h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
- (i) DETAILED DESCRIPTION OF THE INVENTION.
- (j) CLAIM OR CLAIMS (commencing on a separate sheet).
- (k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
- (l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

Claim Objections

3. Claim 2 objected to because of the following informality: The singular verb "is" has to be replaced with a plural verb "are."

Appropriate correction is required.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

5. Claims 31 and 32 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. The claims encompass an article which has instructions that can be executed by a computing platform, embodying functional descriptive material. However, the specification does not have an explicit and deliberate definition regarding the medium. For that reason, the article would reasonably be interpreted by one of ordinary skill in the art as descriptive material, per se.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 2112

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-4, 5-6, 9-10, 16, 21-22, 25-27, and 30-32 are rejected under 35

U.S.C. 102(b) as being anticipated by MacAulay (WO 97/43732).

8. Regarding claims 1-4, 5-6, 9-10, 16, 25-27, and 30, claims 1 and 25 encompass a system and a method for identifying anomalous targets containing one or more image subsystems to generate track files from an image comprising targets, an image processing subsystem to extract features from the track files, and a discrimination subsystem to generate a probabilistic belief function from the extracted features for generating an output indicating that at least some of the targets are anomalous respectively. Claims 2 and 26 specify that the target can be a tissue sample and a cell. Claims 3 and 4 encompass that the imaging subsystem recited in claim 1 can generate track files from optical data such as photographs or scanned images of tissue samples including cells collected by a microscope or a microscopic-imaging camera. Claim 5 specifies that the imaging subsystem generates the track files from the optical data have array elements, which each of them is at least two dimension and has a velocity and a rotational component, which represent respectively movement and rotational movement of a target. Claim 6 specifies that the imaging subsystem recited in claim 1 can generate track files from optical data that have array of elements, which include three dimensional imaging components. Claims 9-10 and 27 specify that the image processing subsystem or the method for identifying anomalous targets identifies the

targets within the image using the track files and generates a the feature sets, which indicates one of motion, rotation, target size, target shape, target outline, ratio of target size to other targets, and ratio of size of predetermined elements. Claim 16 encompasses a discrimination subsystem that generates the belief function from at least one of the selected feature set of the identified targets. Claim 20 specifies that the discrimination subsystem provides revised feature sets to instruct the image processing subsystem to repeat extracting features for the revised feature sets based on belief functions results. Claim 30 specifies that the method in claim 27 can have a process of generating the belief function for at least one of a selected feature set of the identified targets.

MacAulay discloses the same function of the imaging subsystems using a CCD camera (Fig 1-14 Digital High Resolution CCD Camera; page 5, lines 15-18), which captures the images of cell sample which (page 5, lines 15-16) can be considered equivalent to generating track files, and an image processing subsystem as a digital image processing unit (Fig 1-32; page 5, lines 21-28). Moreover, MacAulay discloses that the target of the system can be a tissue (page 1, lines 16-17) and a cell (abstract). A process whether the frequency of MAC-positive cells exceeds a predetermined threshold can be interpreted as a belief function (Fig 10-340; page 13, lines 1-9). The sample of cells imaged with a digital microscope having pixels is disclosed (Abstract). A radial vector containing the velocity and the angle to know the rotational movement and an equation to calculate the elongation, which has a radial vector, to track files from optical data of the image of the target is disclosed (page 18, lines 20-28). Array

elements as pixels (abstract) are disclosed and imply that each array contains a three dimension by moving the microscope in the stage z-direction in multiple focal planes around the approximate frame focus (page 3, lines 11-13). An image processing subsystem that identifies the target image files (page 5, lines 24-25) and generates feature sets such as mean radius, run length texture feature, morphological area, inertia shape, sphericity, compactness, x-centroid, and y-centroid for identification of the target (pages 14-37), which can be used to calculate the feature sets recited in the claims, is disclosed.

9. Regarding claims 21 and 22, claim 21 encompasses a cancerous-cell identification system containing an imaging subsystem to generate track files from one or more images of a tissue sample, an image processing subsystem to extract features of cells from the track file, and a discrimination subsystem to generate a probabilistic belief function from the extracted features for generating an output indicating that at least some of the cells within the one or more images are cancerous. Claim 22 specifies that the image processing subsystem recited in claim 21 extracts features from individual cells using the track file and generates feature sets, which indicate at least one of either cell motion, cell rotation, cell size, cell shape, cell outline, ratio of individual cell size to average cell size, and ratio of nucleus size to cytoplasm.

MacAulay discloses the same function of the imaging subsystems using a CCD camera (Fig 1-14 Digital High Resolution CCD Camera; page 5, lines 15-18) and an image processing subsystem as a digital image processing unit (Fig 1-32; page 5, lines

21-28). Moreover, MacAulay discloses that the target of the system can be a cancerous-cell, a tissue (page 1, lines 14-17), and a cell (abstract), but not the discriminating system using a probabilistic belief function. A process whether the frequency of MAC-positive cells exceeds a predetermined threshold can be interpreted as a belief function (Fig 10-340; page 13, lines 1-9). An image processing subsystem generating feature sets, which can be applied to detect the cell as a target, such as mean radius, run length texture feature, morphological area, inertia shape, sphericity, compactness, x-centroid, and y-centroid for identification of the cell (pages 14-37) is disclosed.

10. Regarding claims 31 and 32, claim 31 encompasses an article containing a storage medium having stored thereon instructions, when executed by a computing platform, result in generation of track files from an image comprising targets, extraction of features from the track file, and generation of a probabilistic belief function from the extracted features for generating an output indicating that at least some of the targets are anomalous. Claim 32 specifies that instructions of the article can generate the feature sets to indicate at least one of target motion, target rotation, target size, target shape, target outline, ratio of target size to other targets, and ratio of size of predetermined elements and use of the track file to identify targets within the image having features associated with the feature sets.

MacAulay discloses the computing platform as a computer connected with the image processing unit by a computer bus (Fig. 1-30; abstract). MacAulay discloses a

Art Unit: 2112

CCD camera (Fig 1-14 Digital High Resolution CCD Camera; page 5, lines 15-18), which generates track files, and a digital image processing unit (Fig 1-32; page 5, lines 21-28) that extracts of features from the track files. Moreover, MacAulay discloses generating feature sets such as mean radius, run length texture feature, morphological area, inertia shape, sphericity, compactness, x-centroid, and y-centroid for identification of the target (pages 14-37), which can be used to calculate the feature sets recited in the claim 32. A process whether the frequency of MAC-positive cells exceeds a predetermined threshold can be interpreted as a belief function (Fig 10-340; page 13, lines 1-9).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 1, 9, 16-18, 20-22, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacAulay Calum et al. (WO 97/43732) in view of Reiser et al. (U.S. 6,125,339).

13. Regarding claims 17-18 and 20, claims 17-18 and 20 specify that the belief functions are initial belief functions generated from known anomalous targets as part of

a supervised training process, and the discrimination subsystem updates the initial belief functions as part of an unsupervised training process based on measurable characteristics of the targets identified by the image processing subsystem. Claim 20 specifies that the discrimination subsystem provides revised feature sets to instruct the image processing subsystem to repeat extracting features for the revised feature sets based on belief functions results.

As discussed before, MacAulay discloses all the features of claims 1, 9, 16, and 21-22. However, MacAulay does not disclose any features in claims 17-18, 20, and 24, but Reiser discloses the supervised training process (col. 2, lines 44-46), the unsupervised training process (col. 2, lines 46-49), and the feature of repeating the extracting for the revised feature sets based on belief functions results (Fig. 2; col. 4, lines 32-35).

MacAulay and Reiser are analogous because they are from the same field of endeavor of method of detection the anomalous of a target.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to use Reiser's method in MacAulay's system for automatically detecting malignancy-associated changes. The motivation would have been to provide determination of an erroneous information sources, inappropriate information combinations, and optimal information granularities with enhanced system performance as suggested by Reiser (col. 2, lines 6-10). Therefore, it would have been obvious to combine MacAulay and Reiser to obtain the invention of claims 17-18, 20, and 24.

14. Claims 1 and 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacAulay Calum et al. (WO 97/43732) in view of Reiser et al. (U.S. 6,125,339), and further in view of Maurer et al. (2001/003375).

15. Regarding claim 7, the imaging subsystem recited in claim 1 generates a plurality of two-dimensional (2D) images of the sample targets at various depths to generate three-dimensional (3D) imaging components of the track file for the image.

As discussed before, MacAulay and Rieser disclose all the features of claims 1. Riser does not disclose any features in claim 7, but MacAulay discloses the various depth of changes calculated to detect the anomalous of the cells (claim 10). However, MacAulay does not disclose the feature of generating three-dimension images from two-dimension images, but Maurer does teach this in the drawings (Fig. 17).

MacAulay, Reiser, and Maurer are analogous because they are from the same field of endeavor of method of image tracking.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to use Reiser's method and Maurer method in MacAulay's system for automatically detecting malignancy-associated changes. The motivation would have been to provide a vision based motion capture system that can be implemented more convenient and efficient as suggested by Maurer (page 1, paragraph [0003]). Therefore, it would have been obvious to combine MacAulay, Reiser and Maurer to obtain the invention of claim 7.

16. Claims 1,8-9,15, and 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacAulay Calum et al. (WO 97/43732) in view of Reiser et al. (U.S. 6,125,339), and further in view of Roth (2003/0041053).

17. Regarding claims 8, 15, and 19, the imaging subsystem recited in claim 1 generates the track file from images retrieved from a remotely located database of images of tissue samples over a network. The features sets in claims 1, 9 and 16-18 are stored remotely and are accessed over a network. The initial belief functions and associated feature sets in claim 18 are stored in a remotely located belief function database for use by other systems.

As discussed before, MacAulay and Rieser disclose all the features of claims 1, 9, and 16-18. However, MacAulay and Riser do not disclose any features of using the remotely located database over a network. However, Roth discloses using a remotely located database by disclosing a publicly accessible, remotely located biological database (Fig 6; page 7, paragraph [0087]) over a network (page 8, paragraph [0090]).

MacAulay, Reiser, and Roth are analogous because they are from the same field of endeavor of method of data manipulation.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to use Reiser's method and Roth's method in MacAulay's system for automatically detecting malignancy-associated changes. The motivation would have been to improve design and method of searching and retrieving information of a multitude of relational databases (page 2, paragraph [0019]). Therefore, it would

have been obvious to combine MacAulay, Reiser and Roth to obtain the invention of claims 8, 15, and 19.

18. Claims 1,9-11, and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacAulay Calum et al. (WO 97/43732) in view of Reiser et al. (U.S. 6,125,339), and further in view of Wang (2001/0051004).

19. Regarding claims 11, and 23, the image processing subsystem recited in claims 1, 9-10, and 21-22 generates a descriptor associated with each feature set of each identified target or cell to indicate when and identified target or cell at least meets a criteria for the associated feature set.

As discussed before, MacAulay and Rieser disclose all the features of claims 1, 9-10, and 21-22. However, MacAulay and Riser do not disclose image processing subsystem can generate a descriptor. However, Wang discloses an image descriptor (page 1, paragraph [0008]).

MacAulay, Reiser, and Wang are analogous because they are from the same field of endeavor of method of data manipulation.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to use Reiser's method and Wang's method in MacAulay's system for automatically detecting malignancy-associated changes. The motivation would have been to provide an optimal accurate image comparison technique, which can generate and utilize image data as suggested by Wang (page 1, paragraphs [0006]-

[0007]). Therefore, it would have been obvious to combine MacAulay, Reiser and Wang to obtain the invention of claims 11 and 23.

20. Claims 1,9, 10-14, and 25-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacAulay Calum et al. (WO 97/43732) in view of Reiser et al. (U.S. 6,125,339), and further in view of Wang (2001/0051004) and Lee (2003/0072470).

21. Regarding claims 12-14, and 28-29, claims 12 and 28 encompass the image processing subsystem and method respectively including a morphological filter perform morphological filtering on the identified targets and filtering to exaggerate features for identified targets meeting a criteria for a feature set. Claims 13 and 29 specify that the image processing subsystem and a method respectively that has the morphological filter attenuates the normal-sized nuclei and darkens nuclei of target cells having larger than normal-sized nuclei. Claim 14 specify the image processing subsystem generates a morphed image file with the exaggerated features for displaying a morphed image to an operator to help the operator identify anomalous targets.

As discussed before, MacAulay, Rieser, and Wang disclose all the features of claims 1, 9-11, and 25-27. However, MacAulay, Riser, and Wang do not disclose the feature of morphological filter. However, Lee discloses a morphological filter, which exaggerates the features of identified target by the terms of erosion and dilation (Fig 4, page 4, paragraph [0047]) including attenuate and darkening the target (Fig 5A-5B; page 4, paragraph [0047]). Lee also discloses the features of displaying a morphed

image and a morphological operator that can identified the target (page 1, paragraph [0008]).

MacAulay, Reiser, Wang, Lee are analogous because they are from the same field of endeavor of method of data manipulation.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made to use Reiser's method Wang's method, and Lee's method in MacAulay's system for automatically detecting malignancy-associated changes. The motivation would have been to make it possible to detect spatial discontinuities and utilizing various data as suggested by Lee (page 1, paragraph [0009]). Therefore, it would have been obvious to combine MacAulay, Reiser, Wang, and Lee to obtain the invention of claims 12-14, and 28-29.

Conclusion

22. No claims are allowed.

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John Wahnkyo Lee whose telephone number is (571) 272-9554. The examiner can normally be reached on Monday - Friday (Alt.) 7:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Stucker can be reached on (571) 272-0911. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2112

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



John W. Lee



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